Farming practices and risk factors for transmission of helminths of free range pigs in Homabay District, Kenya

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Abstract

A questionnaire survey was carried out on 297 pig farmers in Homabay District in order to determine the risk factors associated with the transmission of helminths in free range pigs. Information on pig production and management practices, feeding, and importance of worm infestation and aspects of parasite control was collected.

The survey revealed that pigs were mostly kept for income generation (83.2%) with the majority of the farmers keeping non-descript type of pigs (98%). Tethering was the main system of confining pigs and was mostly done during crop planting (98.6%), growing (99.3%) and harvesting (99%) seasons. The most common feed given to pigs was a mixture of kitchen leftovers and pastures (40.7%) with none of the farmers supplementing their pigs with commercial feeds. Most of the farmers (80%) did not seek advice on pig farming. Deworming was done by only 20.5% of the farmers with 11.4% preferring to use piperazine(Ascarex®,30gm,Cosmos Limited, Kenya) while 8.8% used levamisole(Wormicid®,1.5% W/V, Cosmos Limited, Kenya). Only 3.7% dewormed their animals after every 3 months. Age and sex of pigs were significantly associated with Strongyle infections, while farming experience was significantly associated with Strongyle, Strongyloides spp, Trichuris spp and Ascaris spp infections. Housing, feed-type, deworming history and frequency of deworming were not associated with the prevalence of helminths. Poor husbandry and feeding practices, low level of education and lack of access to quality extension services were identified as possible constraints on pig production. Farmers should be encouraged to improve on management, husbandry practices and productivity of pigs in Homabay District. Gender and level of education would be important considerations in future programmes involving farmers on pig production and parasites in the area.

Key words: age, association, sex, strongyles

Introduction

In Kenya, the livestock sector contributes over 30% of Gross Domestic Product and employs more than 50% of the agricultural labour force (KARI 2011). Pig production has remained relatively unexploited in spite of the fact that the country has a relatively well established pig industry for the African market. Pigs are mainly kept under the indoor and the outdoor production systems. The indoor production system is mainly practiced in Central, Nairobi and Rift Valley provinces with 80% of the pigs being reared under this system (Ng'ang'a et al 2008). Small scale pig farming accounts for 75% of the total number of pigs reared under the indoor system. The outdoor production system is

commonly practiced in Western and Nyanza provinces and is applied to 40% of the total pig population. A number of constraints have been reported to limit pig production in the country and they include helminthosis, poor quality and high cost of feeds, inadequate disease control practices, limited knowledge with regard to pig husbandry and management system and lack of organized breeding programmes (Wabacha 2001; Mutua et al 2011). Studies carried out in the country (Kagira 2002; Kagira 2010) and elsewhere (Nansen and Roepstorff 1999) have shown that the type of production system and management factors may have significant influence on the occurrence of pig helminths (Nissen et al 2011). The association between the occurrence of parasites and the management factors are well understood in pigs reared under the intensive production system particularly in temperate countries ((Nansen and Roepstorff 1999). On the other hand, there is paucity of information on the association between the occurrence of parasites and the management factors in the outdoor reared pigs where helminth infections may have devastating effects on pig health because of the poor housing, hygiene and deworming regime. Furthermore, places differ in terms of climate and agro-ecological zones and parasite control programmes designed for one region may not necessarily be appropriate for another region. In Kenya, knowledge on the association between the management factors and the occurrence of parasites in pigs reared under the free range system is limited to a study by Kagira (2010) in Western Kenya. No such study has previously been carried out in Homabay District, where free range pig keeping is common. Therefore, the objective of this study was to determine the potential risk factors associated with the transmission of helminthes in free range pigs in Homabay District.

Materials and methods

Study area

The study was conducted in Homabay District, Nyanza province with a geographical coverage of 1,160Km2. The district has seven administrative divisions Rangwe, Asego, Ndhiwa, Pala, Riana, Nyarongi and Kobama. The climate of the district is inland equatorial with two distinct regions, the Lakeshore lowlands and the Uplands plateau. The lakeshore lowland lies between 1,143 to 1,220m above sea level and mainly comprise a narrow stretch bordering Lake Victoria on the Northern part of the district. At the end of the Lakeshore is a bay from which the district derives its name. The upland plateau rises from 1,220 m to 1,560m and has undulating terrain. The rainfall pattern is bimodal with the long rain season extending from March to June while the short rain season occurs from August to November. Heavy rain of between 500-1000mm is experienced in the uplands plateau especially of Rangwe and Ndhiwa divisions while the lowlands (Asego, Nyarongi and Western parts of Ndhiwa) receive low rainfall varying from 250 to 700mm (FAO 2007). Temperature varies with altitude and proximity to the lake and tends to increase towards the lowland with an average of 17.1-34.80C. Agriculture is the lifeline of the districts' economy employing over 50% of the residents. Small holder farming is the dominant land use practice accounting for about 86.8% of land cultivated in the district. Livestock production is dominated by various enterprises including cattle (Zebu crosses), sheep, goats, pigs, rabbits and poultry. The total

population of cattle, sheep and goats is estimated at 589,400 animals while that of pigs is estimated at 20,800 (MOLD 2007).

Study design

In this study, which was conducted between September, 2009 and December, 2010, a cross-sectional design was used with the study population consisting of non-descript and cross-breed type of pigs of all ages and sexes from 297 randomly selected households. Most of the pigs were either tethered or kept in a mixed system characterised by free range during the dry season and tethered during the rainy season with the exception of Rangwe Division where pigs were permanently kept indoors.The study farms were selected with the assistance of field extension officers of the Ministry of Livestock Development and Marketing (MLOD) and local administration officials. The sampling unit of interest was individual small holder farms. A list of locations with the highest population of pigs in the seven divisions was made and two locations from each division randomly selected. Subsequently, a list of small scale farmers in the selected locations was established. In Kobama and Nyarongi divisions where there were few pig farmers, the sampling frame consisted of only villages with pigs. In Rangwe Division where the management system was semi-intensive, all the farmers with the semi-intensive system were included in the study. At the village level, households with pigs were established with the help of Extension Officers and other farmers until all the selected farmers were covered.

Questionnaire survey

Structured questionnaires aimed at determining the potential risk factors for helminth infections in pigs in the district were administered through face-to-face personal interviews to pig farmers. The questions were constructed in the English language but administered in the local dialect in order to avoid any misunderstanding between the investigators and the farmers. Specific data were collected on household information, information related to animals (age and sex), pig production and management practices, type of feed given to pigs, importance of worm infestation, clinical signs and parasite control.

Faecal collection and analysis

Animals were grouped into 4 categories: pigs under 3 months of age were classed as piglets, those in the range of 3-5 months were classed as growers, those between 5-7 months were classed as finishers and those above 7 months were classed as adults. Pigs were further classified as males and females. The faecal samples were collected from the animals using clean unused gloves. The samples were taken to the laboratory and analysed to determine the eggs per gram of faeces using the Modified McMaster technique (MAFF 1986).

Statistical analysis

Data were entered into Microsoft Excel and exported to SPSS version 12.0 (Statistical package for Social Scientists, 2003) for statistical analysis. Descriptive statistics for farm level variables were calculated and presented as tables. In the analysis, the dependent variable was the prevalence of helminthes (positive FEC) while the independent variables

were sex and age of the pigs, farming experience, history of deworming, frequency of deworming, feeding and provision of housing. The association between independent and dependent variables was calculated using one way analysis of variance(ANOVA)while the association between the independent categorical variables and the prevalence of various parasites was evaluated using Chi-square test of independence. The level of statistical significance was at $p<0.05$.

Results

Household information

Out of the 297 farmers interviewed, 65.3% were females while 34.7% were males. The mean age of the farmers was 40.78 years with a range of 12-88 years. Formal education had been attained by 78.1% of the farmers. The level of education for the majority was low with 67.7% of the farmers having only gone to primary school, 9.4% having attained secondary school education while only 1.0% had obtained college education. Most of the farmers (79.8%) obtained their income from farming, 5.4% had some form of business, 2.4% both farming and business while 0.7% wereure civil servants. Although other factors such as ethnicity, religious denomination and marital status have been known to influence pig farming on grounds of social exclusion, the ethnic background of the farmers was not explored since the study area is predominantly occupied by one (Luo) tribe. Also, farmers whose religious denomination does not allow them to keep pigs were not included in the sampling frame. The marital status of the farmers was not recorded.

Pig production and management practices

Most of the farmers (56.2%) had kept pigs for less than 1 year, 24.2% had kept pigs for periods of between 1 to 5 years and 19.5% of the farmers had kept pigs for more than 5 years. Majority (98.0%) of the farmers kept non-descript types of pigs (Figure 1) with only 2.0% keeping cross-breed (mainly local breeds and landrace or large white) types of pigs.

Figure 1. Some types of pigs kept by farmers in Homabay District

Pigs were mostly kept for purposes of sale for slaughter at the butchery (83.2%), with 9.4% being kept for slaughter and breeding and 6.1% for slaughter and home consumption. Only 0.7% of the farmers kept pigs for breeding. The main system of confining pigs was tethering and was mostly done during the crop planting (98.6%), growing (99.3%), harvesting (99.0%) and fallowing (86.5%) seasons. Pigs were tethered around the homesteads. The tether ropes were weak and could allow pigs to break away, while in some cases, the ropes caused wounds on the legs or necks of the tethered pigs. Only 0.7% of the farmers confined their pigs in a pen while 12.8% allowed their pigs to free range during the fallowing season.

Types of feed given to pigs

Table 1 shows the types of feed given to pigs by farmers in Homabay District. The most common type of feed given to pigs was a mixture of kitchen leftover and pastures (40.7%). Pastures included various grasses, weeds and shrubs. The remainder of the feeds included mixtures of Machicha (brewers waste), cooked sweet potato tubers, sweet potato vines, flour (unga), guavas, pawpaw and cassava. None of the farmers supplemented their pigs with commercial feeds.

Table 1: Types of feed given to pigs by farmers in Homabay district

Feed type	Number	Percentage
Kitchen left over + Pasture	121	40.7
Kitchen left over + Pasture + Sweet Potato tubers	98	33.0
Kitchen left over + Pasture + Guavas	20	6.8
Kitchen left over + Pasture + Sweet potato vines +Guavas	19	6.4
Kitchen left over + Pasture + Sweet potato +Sweet potato vines	10	3.4
Kitchen left over + Pasture + Sweet potato vines	8	2.7
Kitchen left over	6	2.0
Kitchen left over + Pasture + Machicha	4	1.3
Pasture + Sweet potato tubers + Guavas + Cassava tubers	4	1.3
Kitchen left over + Pasture + Flour	2	0.7
Kitchen left over + Pasture + Pawpaw	2	0.7
Pasture + Flour (left over from posho mill)	2	0.7
Kitchen left over + Sweet potato tubers + Flour	1	0.3

Importance of worm infections and clinical signs in pigs

Intestinal worm infections were considered to be of importance by 34% of the farmers (Table 2) while 66% of the farmers did not know that intestinal worm infections were of importance. Most of the farmers (79.1%) could not recognize pigs infected with intestinal worms. A few farmers (14.5%) could identify worm infections by observing poor growth while 6.4% based their observation on distended abdomen. Most of the farmers (81.8%)

did not seek advice on pig farming while only 16% sought advice from extension officers.

Parasite control

Few farmers (20.5%) dewormed their animals with 11.4% preferring to use piperazine, 8.8 % using levamisole while 0.3% used herbal medicine (concoctions of different plants). With regard to the frequency of deworming, 7.7% of all the farmers dewormed their animals irregularly, 6.7% every one month, 3.7% after every 3 months and 2.4% after 1-2 months.

Table 2: Importance of worm infestation, clinical signs and source of advice on pig farming

Variable	Number	Percentage
Importance of intestinal worm infection		
Important	101	34
Not important	196	66
Clinical signs of worm infection		
Do not know	235	79.1
Distended abdomen	19	6.4
Poor body condition	43	14.5
Source of information on pig farming		
Other farmers	4	1.3
Extension officers	48	16.0
Others	2	0.7
None	243	81.8

Faecal examination

Eighty three percent of the animals examined were shedding nematode eggs which were; Strongyles (75%), Strongyloides spp (26.6%), Trichuris spp (7.8%), Ascaris spp (5.4%) and Metastrongylus spp (0.3%). From coprocultures of Strongyle positive faecal samples, Oesophagostomum spp comprised 74%, Hyostrongylus rubidus 22% and Trichostrongylus spp 4% of the larvae.

Factors associated with helminths infection

Females recorded significantly ($p = 0.028$) higher levels of infections with strongyles than males. Sex of the pigs was significantly associated with Strongyle infections ($p = 0.037$, $df = 2$, $\chi 2 = 6.5$). Finishers recorded significantly ($p = 0.04$) higher levels of infection with strongyles than adults. Growers also recorded significantly ($p = 0.036$) higher levels of infection with strongyles than adults. Age of the pigs was significantly associated with Strongyle infections ($p = 0.037$, $df = 2$, $\chi 2 = 13.4$). Farming experience was significantly associated with Strongyle infections ($p = 0.000$, $df = 93$, $\chi 2 = 177.7$), Strongyloides spp infections ($p = 0.000$, $df = 72$, $\chi 2 = 139.1$), Trichuris spp infection (($p = 0.000$, $df = 33$, $\chi 2 = 152.3$) and Ascaris spp infection ($p = 0.000$, $df = 30$, $\chi 2 = 152.3$).

There was no significant ($p > 0.05$) association between the feed type and the prevalence of helminth parasites. Likewise, there was no significant ($p > 0.05$) association between the history of deworming, frequency of deworming and the prevalence of helminth parasites. The variables investigated and their relative frequencies are shown in Table 1 and Table 3.

Table 3 : Variables investigated and their relative frequencies

Variable	Number examined	Percentage
Animal level factors		
Age		
Piglets	16	4.3
Growers	96	25.8
Finishers	50	13.4
Adult	210	56.5
Sex		
Females	248	66.7
Males	124	33.3
Farm level factors		
History of deworming		
Yes	61	20.5
No	236	79.5
Deworming frequency		
Every 1 month	20	6.7
Every 3 months	11	3.7
After 1-2 months	7	2.4
Irregularly	23	7.7
Provision of housing		
Yes	6	2.1
No	291	97.9
Farming experience		
Less than 1 year	167	56.2
Between 1-5 years	72	24.2
More than 5 years	58	19.6

Discussion

In the present study, majority of the pig farmers (65.3%) were females with the rest of the farmers being males. This is similar to the findings of Mutua et al (2010) in Kakamega District and Kagira et al (2010) in Busia District, Western Kenya in which women were considered to play a significant role in the management of the family pig. The results of this study also concur with the findings of Nsoso et al (2006) in Ramotswa village, Botswana in which most of the pig farmers (75%) were females. However, the results of the current study contrast with the findings of Nsoso et al (2004) in southern Botswana in which 75.6% of the farmers were males. Women in the rural areas are perceived to play important roles in livestock production by staying at home for long hours and performing various tasks in all aspects of agricultural production (Sabo 2006). They therefore contribute substantially to livestock production especially in activities that require them to stay at home such as feeding and watering the pig. The level of education for the majority of the farmers was low with 67.7% of the farmers having only gone to primary school. The low level of education may be attributed to high levels of poverty in the district and is a disadvantage to the farming community in this area because it could act as a barrier to the acquisition of scientific information and uptake of new technologies on pig husbandry and production aspects to the farmer. Projects involving transfer of new technologies should strengthen the capacity of women and increase their access to education and training on pig husbandry and production in the district.

Tethering was the most preferred way of confining pigs and was mostly done during the crop planting, growing and harvesting seasons to protect the crops from scavenging and rooting behaviour of the pigs. This is consistent with the findings of other studies in Ghana (Permin et al 1999) and Western Kenya (Githigia et al 2005; Kagira et al 2010) but contrast with the findings of Mutua et al (2010) in Western Kenya where farmers were reluctant to tether their pigs because of the belief that tethering denies pigs exercise which was believed to be crucial for pigs' healthy development. Most of the farmers did not house their pigs. These findings are consistent with those Nsoso et al (2004) and Githigia et al (2005) where a similar phenomenon was reported. Pigs which are not housed are in constant contact with soil because of their rooting behaviour which increases the uptake of infective parasite eggs and larvae as well as intermediate hosts hence increased worm burdens. Although the pigs' scavenging behaviour has been shown to have clear nutritional benefits (Lekule and Kyvsgaard 2003), housing should be encouraged to increase productivity and safeguard the pigs from theft and diseases of public health importance such as cysticercosis.

In the current study, pigs were mostly fed on kitchen left over and pasture (grass, weeds and shrubs) with no supplementation. Although the health status of the sampled pigs was not ascertained through veterinary clinical examination, it was observed that most of the pigs, particularly growers and finishers were stunted in growth. Pigs kept under the traditional management systems which are characterized by low inputs are poorly supplemented or they are not supplemented with commercial feeds (Nsoso et al 2006; Kagira 2010; Nissen et al 2011). This has been linked to the high cost of feeds (Wabacha 2001; Kagira et al 2010) with the farmers resorting to giving pigs locally available and cheap feeds. Studies have shown that feeding pigs on different kinds of residues under

the free range system is more viable than supplementation with commercial feeds under the intensive system (Lekule and Kyvsgaard 2003). Poor nutrition lowers the resistance of the animal to infections thus enhancing the establishment of worm burdens and increasing their pathogenicity. Consequently, worm burdens tend to be higher in poorly fed than in well fed animals. Therefore, information on the quality and use of locally available feed materials in the study area needs further exploration.

Although livestock extension services are provided by the government extension officers and are easily accessible, most of the farmers in the current study did not seek advice on pig management and production and majority did not know the importance of worm infections. These findings are in agreement with those of Mutua et al (2010) in Kakamega District, Western Kenya where farmers were not aware that pigs could be treated and could not identify common pig diseases. Also, few farmers dewormed their pigs and for those who did, only 3.7% used the recommended frequency of deworming which is every three months. This may be explained by the low level of education which restricts the awareness of the farmers on the need to acquire new knowledge on pig husbandry in the study area. It could also be due to the fact that most farmers had kept pigs for a short period of time i.e. less than one year and may have had less experience in most of the practices concerning nearly all aspects of pig keeping. The findings of this study contrasts with those of Kagira et al (2010) in Busia District in which farmers appeared to have a relatively good knowledge of clinical signs associated with worm infections. The relatively good knowledge of worm infections reported by Kagira et al (2010) may be attributed to the awareness created by earlier research project in Busia District. Anthelmintic treatment reduces the prevalence and severity of helminth infections and may significantly influence their epidemiology. Consequently, worm burdens tend to be higher in animals under the free range system with no anthelmintic treatment than in animals treated routinely with anthelmintics. Routine deworming of free range pigs is essential to avoid parasite build up.

Age and sex of pigs were significantly associated with Strongyle infections. Generally, age plays a significant role in the development of immunity in animals in that older animals tend to be resistant to parasitic infections than young animals. This is because as the animals get older, they are exposed to parasites through continuous infection and re-infection, generating immune responses which may last depending on the type of parasites (Swai et al 2010). Females are more prone to parasitism particularly during late pregnancy and lactation. This is attributed to the stress that is associated with impairment of immune function thus lowering immunity and increasing the worm burdens in these animals (Kusiluka and Kambarage 1996).

There was no association between housing, deworming history, frequency of deworming and the type of feed and the prevalence of parasites in the study area. This is contrary to reports by Roepstorff and Jorsal (1990), Kagira (2001), Kagira et al 2008 and Kagira et al (2011) in which the prevalence of parasites in indoor kept pigs was associated with management factors such as type of feed provided, type of anthelmintic used and deworming frequency. The lack of association between these factors and the prevalence

of helminths may be explained by lack of protein supplementation, lack of housing in most of the farms visited and the low number of farmers deworming their animals which is common under the extensive production system (Esrony et al 1997).

In conclusion, a wide variety of pig parasites exist in the study area. The occurrence of these parasites was associated with sex and age of the animals and experience in pig farming. Poor husbandry and feeding practices, low level of education and lack of access to quality extension services were identified as possible constraints on pig production. Farmers should be educated and encouraged to improve on management, husbandry practices and productivity of pigs in Homabay District. There is need for control of helminthes in the district and control measures should integrate better nutrition with anthelmintic treatment.

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To farm pig farmers should make a pollution free environment. The pig industry needs a particular location. Without careful management of waste products, it may be very dangerous problem for child pig. It is a great and profitable process to make manure from the disposal of the pigs. It is very useful for agriculture. The environment of the outside and inside should protect all times because it is very essential to farming pigs. Inside environment is important for their health. The farming area should be made clean and dry.Â Hi, am just starting to practice pig farming but I need a professional like you to take me through necessary ways of how I can become successful in this project. Please help me, and am in Kamala. This is my telephone: 0701491365. A questionnaire survey was carried out on 297 pig farmers in Homabay District in order to determine the risk factors associated with the transmission of helminths in free range pigs. Information on pig production and management practices, feeding, and importance of worm infestation and aspects of parasite control was collected. The survey revealed that pigs were mostly kept for income generation (83.2%) with the majority of the farmers keeping non-descript type of pigs (98%). Tethering was the main system of confining pigs and was mostly done during crop planting (98.6%), growing (99.3%) and h This study investigated the epidemiology of nematodes in free range pigs in Busia District, Kenya. Three hundred and six pigs from 135 farms were sampled for faeces that were analysed for nematode eggs per gram (EPG) of faeces using the McMaster technique. The nematode eggs were also identified to genus and species based on morphology. A questionnaire on risk factors was also administered to the pig owners. The overall prevalence and mean nematode EPG were 84.2% and 2,355, respectively.Â In conclusion, this study has provided information on nematode infections and the associated risk factors for free range pigs in Busia District, which can be used when implementing integrated control measures. PMID: 21833678. DOI: 10.1007/s11250-011-9951-9.